

**CLAIMS**

1. A composition which comprises an ingredient which is adversely affected by UV light in the presence of  $\text{TiO}_2$  and/or  $\text{ZnO}$ , and  $\text{TiO}_2$  and/or  $\text{ZnO}$  which has been doped with another element and/or reduced  $\text{ZnO}$ .
- 5 2. A composition according to claim 1 which contains  $\text{TiO}_2$  and/or  $\text{ZnO}$  which has not been doped or reduced.
3. A composition according to claim 1 or 2 wherein the dopant is manganese, vanadium, chromium or iron.
4. A composition according to claim 3 wherein the dopant is  $\text{Mn}^{3+}$ .
- 10 5. A composition according to any one of the preceding claims wherein the dopant is present in an amount from 0.05% to 10 mole %.
6. A composition according to claim 5 wherein the dopant is present in an amount from 0.5 to 2 mole % by weight.
7. A composition according to any one of the preceding claims which  
15 comprises doped titanium dioxide.
8. A composition according to any one of the preceding claims wherein the titanium dioxide is in rutile form.
9. A composition according to of claim 1 or 2 which comprises reduced zinc oxide.
- 20 10. A composition according to any one of the preceding claims wherein doped and/or undoped  $\text{TiO}_2$  and/or  $\text{ZnO}$  therein is coated with inorganic or organic coating.
11. A composition according to any one of the preceding claims which comprises 0.5 to 20 mole % by weight of the doped  $\text{TiO}_2$  or  $\text{ZnO}$  or reduced  $\text{ZnO}$ .
- 25 12. A composition according to any one of the preceding claims wherein the doped or reduced oxide has a particle size from 1 to 200 nm.
13. A composition according to any one of claims 1 to 11 wherein the doped or reduced oxide has a particle size from 100 to 500 nm.
14. A composition according to any one of the preceding claims which is  
30 a UV sunscreen composition.

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15. A composition according to any one of the preceding claims which is suitable for cosmetic use.

16. A composition according to claim 14 or 15 having a rate of loss of UV absorption at least 5% less than that of a composition having the same formulation  
5 except that it does not contain the said  $\text{TiO}_2$  and/or  $\text{ZnO}$  which has been doped with another element or the said reduced zinc oxide.

17. A composition according to any one of the preceding claims which contains a UV sunscreen agent which is adversely affected by  $\text{TiO}_2$  and/or  $\text{ZnO}$ .

18. A composition according to any one of claims 14 to 17 wherein the  
10 organic sunscreen agent is a paraaminobenzoic acid, ester or derivative thereof, a methoxy cinnamate ester, a benzophenone, a dibenzylomethane, an alkyl- $\beta,\beta$ -phenyl acrylate, a triazine, a camphor derivative, an organic pigment, a silicone based sunscreen agent or 2-phenylbenzimidazolyl-5 sulphonic acid or phenyldibenzimidazolyl sulphonic acid.

15 19. A composition according to any one of claims 16 to 18 wherein the rate of change of the ratio of the loss of UVA absorption to the loss of UVB absorption is less than that of a composition of the same formulation except that the  $\text{TiO}_2$  and /or  $\text{ZnO}$  present is not doped.

20. A composition according to claim 19 wherein the rate of change of the  
20 ratio is greater because the rate of loss of UVA absorption is reduced.

21. A composition according to any one of claims 14 to 20 which comprises 0.1% to 20% by weight of organic sunscreen agent(s).

22. A composition according to any one of claims 14 to 21 which contains one or more of a fatty substance, organic solvent, silicone, thickener, demulcent,  
25 UVB sunscreen agent, antifoaming agent, moisturising agent, perfume preservative, surface activation filler, sequestrant, anionic, cationic, nonionic or amphoteric polymer, propellant, alkalising or acidifying agent, colorant, metal oxide pigment, vitamin, antioxidant, anti-ageing factor and stabilizer.

23. A composition according to any one of claims 14 to 22 which is a  
30 sunscreen.

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24. A composition according to any one of claims 14 to 23 which is in the form of a lotion, gel, dispersion, cream, milk, powder or solid stick.

25. A composition according to claim 23 or 24 which comprises a water-dispersible and an oil-dispersible  $\text{TiO}_2$  and/or  $\text{ZnO}$ .

5 26. A composition according to any one of claims 1 to 13 which is a polymeric composition.

27. A composition according to claim 26 wherein the ingredient which is adversely affected by  $\text{TiO}_2$  and/or  $\text{ZnO}$  suffers a change in physical properties.

10 28. A composition according to claim 26 or 27 wherein the physical property is tensile strength.

29. A composition according to of claim 26 to 27 wherein the physical property is colour.

30. A composition according to any one of claims 26 to 29 wherein the polymeric material is thermoplastic.

15 31. A composition according to any one of claims 26 to 29 wherein the polymeric material is thermosetting.

32. A composition according to any one of claims 26 to 31 which is in the form of a three dimensional article.

20 33. A composition according to any one of claims 26 to 31 which is in the form of a film.

34. A composition according to claim 33 which is in the form of a photographic film.

35. A composition according to any one of claims 26 to 31 which is in the form of a coating composition.

25 36. A composition according to claim 35 which is in the form of a paint or varnish.

37. A composition according to any one of the preceding claims wherein the ingredient which is adversely affected by  $\text{TiO}_2$  and/or  $\text{ZnO}$  is an ethylenically unsaturated compound or one possessing a labile hydrogen atom.

30 38. A composition according to claim 1 substantially as hereinbefore described.

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39. Use of a doped or reduced  $\text{TiO}_2/\text{ZnO}$  as defined in any one of claims 1 to 6 and 10 to reduce the concentration of one or more organic UV sunscreen agents adversely affected by  $\text{TiO}_2$  and/or  $\text{ZnO}$  in a cosmetic UV screening composition.

40. Use of a doped or reduced  $\text{TiO}_2/\text{ZnO}$  as defined in any one of claims 1 to 6 and 10 to reduce the rate of loss in UV absorption of a sunscreen composition containing an organic UV sunscreen agent which is adversely affected by  $\text{TiO}_2$  and/or  $\text{ZnO}$ .

41. A method of increasing the effectiveness of an organic UV sunscreen composition which comprises one or more components which are degraded by  $\text{TiO}_2$  and/or  $\text{ZnO}$  which comprises incorporating into the composition a doped or reduced  $\text{TiO}_2/\text{ZnO}$  as defined in any one of claims 1 to 6 and 10.

42. A method of increasing the UV spectrum of a sunscreen formulation which comprises an organic sunscreen agent which is adversely affected by  $\text{TiO}_2$  and/or  $\text{ZnO}$  which comprises incorporating in the formulation doped  $\text{TiO}_2$  and/or doped or reduced  $\text{ZnO}$  as defined in any one of claims 1 to 6 and 10.

43. A method of reducing the production of a toxic compound in a UV sunscreen composition which contains an ingredient which produces a toxic compound due to the presence of  $\text{TiO}_2$  and/or  $\text{ZnO}$  which comprises incorporating therein doped  $\text{TiO}_2$  and/or doped or reduced  $\text{ZnO}$  as defined in any one of claims 1 and 4 to 7.

44. A method of reducing the adverse effects of  $\text{TiO}_2$  and/or  $\text{ZnO}$  on one or more components of a composition which comprises incorporating in the composition a doped or reduced  $\text{TiO}_2/\text{ZnO}$  as defined in any one of claims 1 to 6 and 10.

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